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AUTOMATION
ENGINEERING

____ *PIC-I/O* Multifunction I/O Board _____

The ***PIC-I/O*** multifunction I/O board is compatible with the ***PIC-SERVO*** and ***PIC-STEP*** motor control modules and provides the following I/O capabilities:

- 12 digital I/O lines independently programmable as inputs or outputs.
- Three 8-bit analog input channels (0 - 5v input).
- Two 20 KHz PWM output channels with high current (10 amp) output drivers.
- One 32 bit counter/timer.
- RS485 serial interface allows up to 32 modules (***PIC-I/O***, ***PIC-SERVO*** or ***PIC-STEP***) to be controlled from a single serial port. Connects to an RS232 port through commonly available adapters or using the ***Z232-485*** converter board.
- A small prototyping area allows for customization.
- The 2" x 3" board can be stacked with other controller boards.
- Test software provided including Window95/98 test example source code.

1. Quick Start

What you will need:

PIC-I/O Board
Z232-485 Converter Board (or equivalent)
Logic power supply (7.5 - 12vdc, 500 ma)
10 pin flat ribbon cable with standard IDC socket connectors at both ends
Straight DB9 male / DB9 female cable to PC COM port
PC compatible computer running Windows95/98
Test software -
NMCTest.zip for Windows95/98
(download software from http://www.jrkerr.com)

Interconnections and Jumpers:

Basic interconnections and jumpers are shown in *Figure 1* for both a single module and for a multiple module configuration. Modules may be ***PIC-I/O*** modules or ***PIC-SERVO*** or ***PIC-STEP*** motor controllers. On the ***Z232-485*** converter, jumpers JP3 and JP4 are installed in the 1-2 position for use as a simple converter. Jumper JP5 is installed to distribute logic power to the controller boards over the communications cable. Logic power is supplied on connector JP6. (If

CAUTION

The ***PIC-I/O*** board does not incorporate safeguards for fail-safe operation. As such, this board should not be used in any device which could cause injury, loss of life, or property damage. J.R. Kerr makes no warranties whatsoever regarding the performance, operation, or fitness of this board for any particular purpose.

you are not using the ***Z232-485*** converter, please refer to the pin definitions for JP1 and JP2 in *Section 2.1* for connecting logic power and RS485 signals from your RS485 COM port.)

On the ***PIC-I/O*** board, jumpers JP6 and JP7 are installed to connect logic power supplied by the communications cable to the board's logic supply. Connector JP8 should be left unconnected. In the *single* module configuration, the three jumpers near the label JP3 should be installed as shown. In the *multiple* module configuration, these jumpers should only be installed on *last* module furthest from the PC host; on all other modules, jumpers on JP3 should be left *uninstalled*.

Power for the high current PWM drivers should be connected to the two uppermost screw terminals, with 6 - 48vdc connected to the terminal towards the edge of the board and GND connected to the adjacent terminal as shown in *Figure 1*.

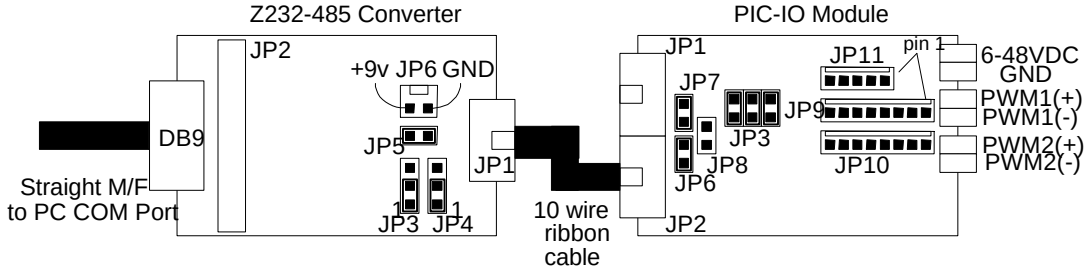
Loading and Running Software:
Unzip (using PKUNZIP) NMCTEST.ZIP into a single directory. Before starting up the test code, make sure all of your jumpers and interconnections are as shown in *Figure 1*. Also make sure you have logic power supplied to the ***Z232-485*** converter.

Run the program NMCTest.exe. You will be prompted for the COM port and baud rate you would like to use. Choose the appropriate COM port, and initially, use a baud rate of 19200. The program will attempt to locate NMC (*Networked Modular Control*) modules (***PIC-I/O***, ***PIC-SERVO*** or ***PIC-STEP***), connected to the selected COM port. If no modules are found, make sure that everything is connected correctly, that jumpers are set correctly, and that logic power is applied. Click on “Reset Network” to try again or with a different COM port.

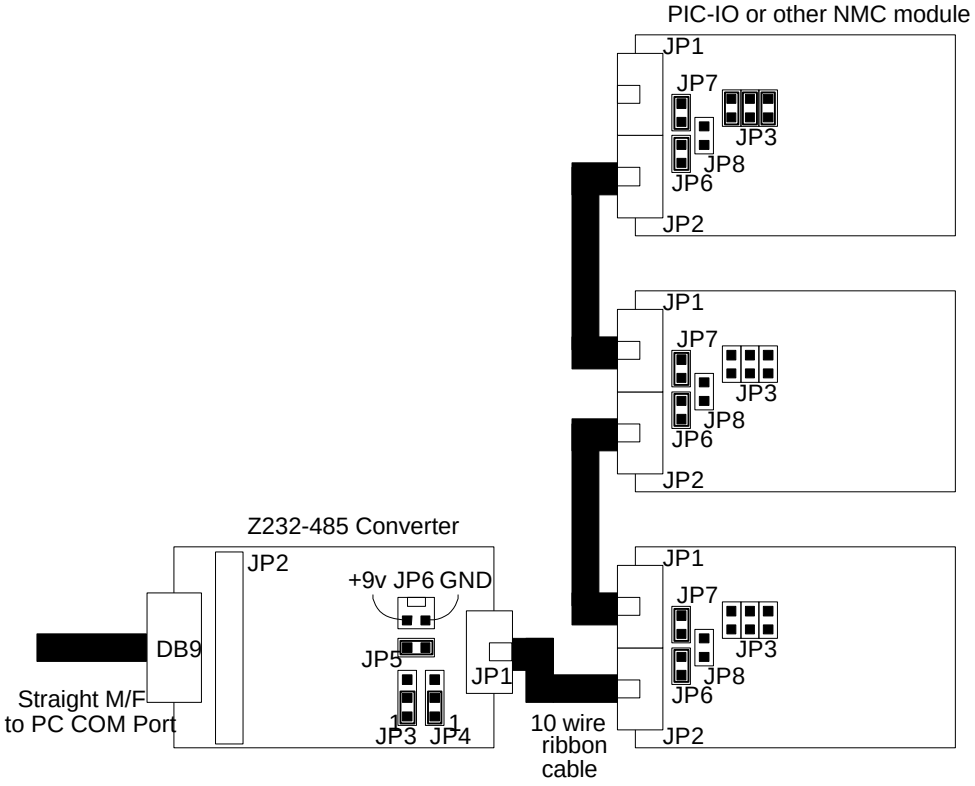
Once modules are found, the list box on the left side of the window will display the list of modules found. Module 1 will be the last controller which is furthest from the host PC. Clicking on different modules in the list will display the status and controls for that particular module.

The ***PIC-I/O*** control panel will display all of the module’s inputs and allow you to control the outputs. Operation of the ***PIC-I/O*** from this control panel is fairly straightforward, but you can click on the “Help” button for specific details of operation.

Single Module Configuration



Multiple Module Configuration



CAUTION: Connecting communications cables incorrectly, or installing jumpers JP3, JP4 and JP5 (on the *PIC-I/O* board) in the wrong location may damage the *PIC-I/O* or other NMC controller chip!

Figure 1 - Basic Interconnections.

2. Connectors and Jumpers

2.1 Pinouts

Digital I/O Connector: ***PIC-I/O*** Multifunction I/O Board JP9

Pin	*Definition*
1	Ground - *towards the edge of the board*
2	I/O 1 (*all pins*: TTL level input, CMOS, TTL compatible output - 15 ma max.)
3	I/O 2
4	I/O 3
5	I/O 4
6	I/O 5
7	I/O 6
8	+5v

Digital I/O Connector: ***PIC-I/O*** Multifunction I/O Board JP10

Pin	*Definition*
1	Ground - *towards the edge of the board*
2	I/O 7
3	I/O 8
4	I/O 9
5	I/O 10 (or Counter input)
6	I/O 11
7	I/O 12
8	+5v

Analog Input Connector: ***PIC-I/O*** Multifunction I/O Board JP11

Pin	*Definition*
1	Ground - *towards the edge of the board*
2	Analog Input 1 (*all pins*: 0 - 5v input)
3	Analog Input 2
4	Analog Input 3
5	+5v

Power Connections: ***PIC-I/O*** Screw Terminals

Pin	*Definition*
1	PWM driver power input (6 - 48vdc) - *at upper edge of board*
2	Ground
3	PWM Channel 1 (+)
4	PWM Channel 1 (-)
5	PWM Channel 2 (+)
6	PWM Channel 2 (-)

Network Connectors: ***PIC-I/O*** Board JP1, JP2

Pin	*Definition*
1	RCV+ (***Z232-485*** XMT+)
2	RCV- (***Z232-485*** XMT-)
3	XMT+ (***Z232-485*** RCV+)
4	XMT- (***Z232-485*** RCV-)
5	ADDR_IN on JP1, ADDR_OUT on JP2
6	GND
7	Logic power (7.5 - 12vdc)
8	GND
9	Logic power (7.5 - 12vdc)
10	GND

2.2 Jumpers

PIC-I/O Board Jumpers:

Jumper	*Description*
JP3	Connects ADDR_IN to GND. Insert jumper for the last module on the network (or if only 1 module is used)
JP3,JP4	Enables termination resistors on RX and TX. Insert these jumpers for the last module on the network (or if only 1 module is used).
JP6,JP7	Logic power interconnection. Inserting JP6 connects logic power to network connector JP2. Inserting JP7 connects logic power to JP1. These are used to control the distribution of logic power over the network cables. Normally both of these jumpers are installed.

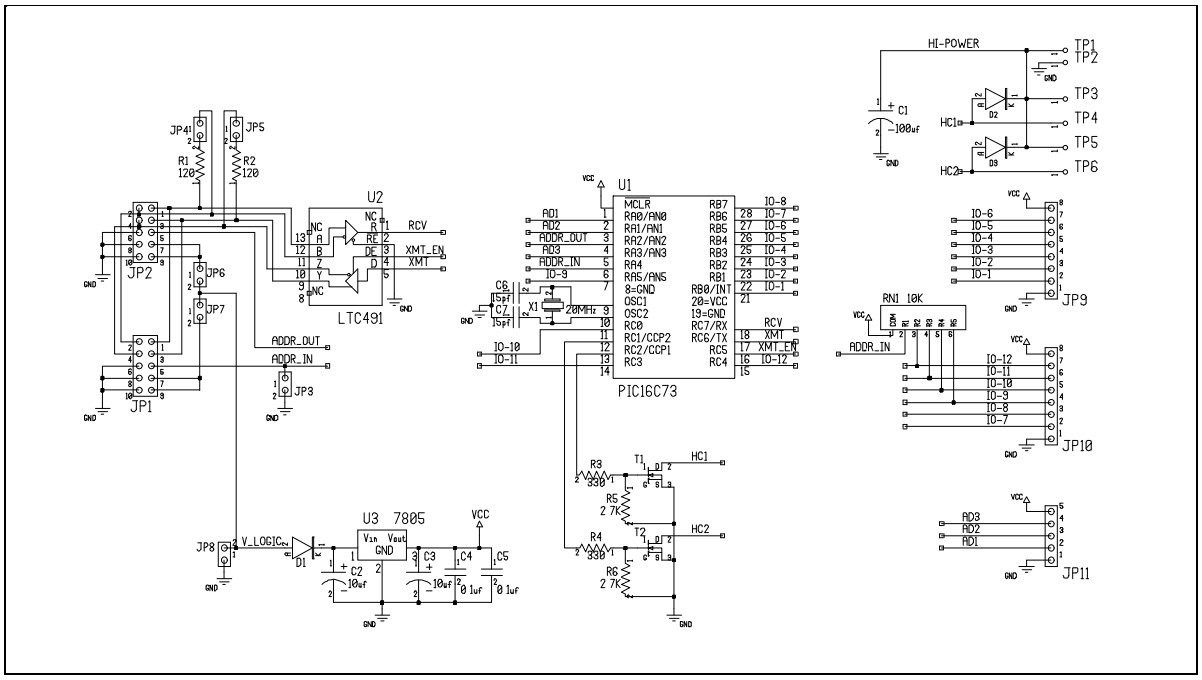


Figure 2 - ***PIC-I/O*** Schematic Diagram.

2.3 Ordering Information

Part Number	*Description*
KAE-T2V1-BDV1	***PIC-I/O*** Multifunction I/O Controller Board

3. *PIC-I/O* Board Description

The ***PIC-I/O*** board is a multifunction I/O expansion board compatible with ***PIC-SERVO*** and ***PIC-STEP*** motor control modules. The board is designed so that up to 32 modules can be connected directly to a single standard serial port (using an RS232-RS485 converter if necessary).

3.1 *PIC-I/O* Controller

The heart of the ***PIC-I/O*** controller board is the ***PIC-I/O*** controller chip. It controls all of the communications and I/O functions. Please refer to the ***PIC-I/O*** data sheet for details on ***the PIC-I/O*** command set and communications protocol.

3.2 Digital I/O

The ***PIC-I/O*** has 12 general purpose TTL/CMOS compatible I/O bits appearing on connectors JP9 and JP10. I/O pins 1-8 have 20K pull-up resistors, and I/O pins 9-12 have 10K pull-up resistors. As outputs, each I/O pin can source or sink up to 20 ma, but only a total of 200 ma may be sourced or sunk for the total 12 I/O pins. I/O pin 10, when configured as an input, can also be used as an event counter which is triggered on a rising signal edge.

3.3 PWM Outputs

The ***PIC-I/O*** has 2 PWM outputs with low-side high-current drivers. The PWM output is a 20 KHz square wave of programmable duty cycle. A high-current supply (6-48vdc) can be connected to the screw terminals 1&2, a load for PWM output 1 can be connected to screw terminals 3&4, and a load for PWM output 2 can be connected to screw terminals 5&6.

Non-inductive loads of up to 10 amps may be driven from each output, or inductive loads up to 2 amps may be used. Larger inductive loads may be used if an appropriately sized protection diode is placed across the inductive load to absorb the inductive kick-back.

If more than 2 amps is driven by either of the PWM outputs, the power transistors T1 and T2 should be attached to a heat sink using electrically insulating hardware.

3.4 Analog Inputs

Three 8-bit analog inputs appear on connector JP11. The input voltage should be in the range of 0 to +5v.

3.5 Logic Power Output & Prototyping Area

+5vdc appears on connectors JP9, JP10 and JP11, and may be used for powering sensors or other circuitry. No more than 300 ma should be drawn from this supply. (Note that the +5vdc is derived from the logic power supplied to the board, which may also limit the output.)

The ***PIC-I/O*** board also has a small prototyping area, an array of 74 pads on 0.10" spacing. This may be used for small amounts of custom circuitry such as opto-isolation or analog filtering.

4. Contact Information

Additional information may be found from these sources:

J R Kerr Automation Engineering **www.jrkerr.com**

Information about the ***PIC-SERVO*** motor controller and related products including ordering information, product documentation and test software. Datasheets, application notes and test code may be downloaded from the page: **http://www.jrkerr.com/docs.html**. Technical support is provided via e-mail. Send your questions to **techsupport@jrkerr.com**.

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